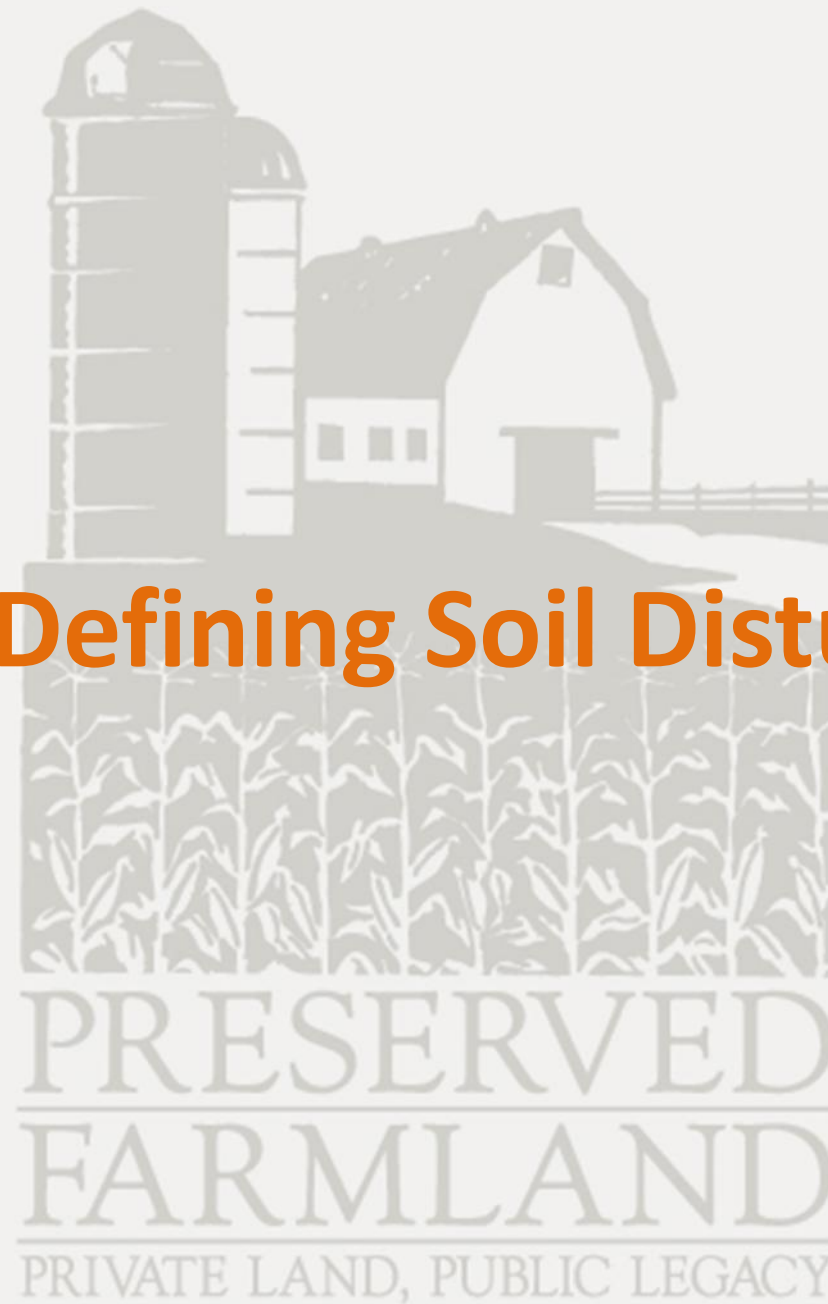


Part II: Defining Soil Disturbance



RUTGERS
New Jersey Agricultural
Experiment Station

Assessment of Soil Disturbance on Farmland

Presented to

New Jersey State Agriculture Development Committee

by

Dr. Daniel Gimenez

Daniel Kluchinski

Dr. Stephanie Murphy

Loren S. Muldowny

RUTGERS
School of Environmental
and Biological Sciences

RUTGERS
New Jersey Agricultural
Experiment Station

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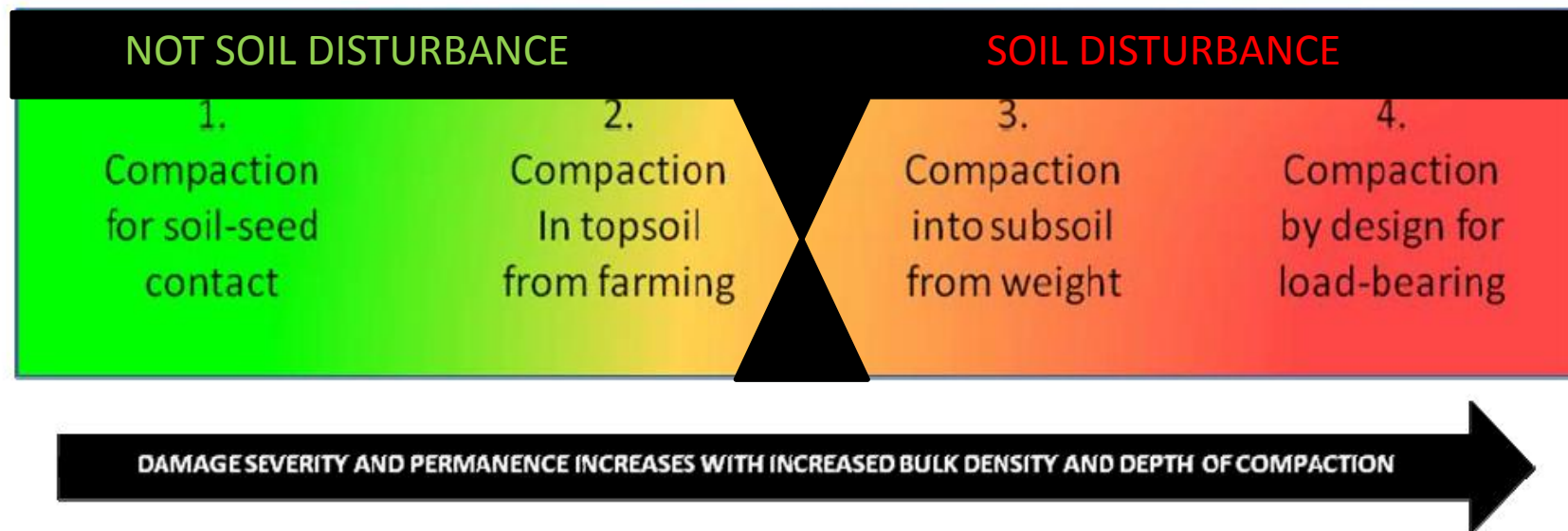
Rutgers Study Conclusions

- **Effects of Compaction on Soil**
 - Soil structure destroyed
 - Plant growth negatively affected
 - Natural hydrology circumvented
 - Increased water runoff/pollution hazard
 - Soil compaction not easily or rapidly remediated
 - Compacted soils have increased risk of greater subsequent compaction
 - Subsoil compaction is a long-term and possibly unsolvable problem.
 - Soils compacted for engineering purposes are permanently changed.
 - Soils compacted for engineering have a nearly impermeable surface layer or compacted layer.

Rutgers Study Conclusions

Degrees of Soil Compaction

Figure 1. Degrees of soil compaction often encountered in agricultural operations, ranging from mild (1) to most severe (4).



“The degree and depth of the disturbance by compaction, as well as soil type, influences whether a remedy is possible or feasible, or whether the damage is permanent.”

- Rutgers Assessment of Soil Disturbance on Farmland

Rutgers Study Conclusions

Table 1. Summary of the relative impact of practices on selected soil functions and their potential for remediation¹

Practice	Soil Functions			Potential for Remediation ²
	Food and Biomass Production	Storing, Filtering and Transformations	Biological Habitat and Gene Pool	
Geotextiles	Very negative (no biomass production)	Limited reduction of biological activity and of exchanges of matter and energy with the atmosphere.		Medium to High
Impervious Cover-Seasonal	Enhanced (biomass production augmented)	Limited negative or neutral impact due to short time scale.		Very High
Permanent Structures	Very negative impact on all soil functions			Very Low
Outdoor Equine Training Tracks	Very negative impact on all soil functions			Low

The study did not consider size and scope of disturbance, just the type of disturbance.

Rutgers Study Conclusions

1. Most minor to significant negative practices can be remedied through various cultural practices, however, increasing costs (time, money) may be prohibitive and reduction in crop yield or quality may be depressed for periods of time.
2. Soil under almost any condition can be improved, but there is potential for a loss of productivity if the soil structure has been irreparably harmed.

Definitions

Soil Profile



A vertical cross-section of soil showing the characteristic horizontal layers or horizons of the soil, which have formed as a result of the combined efforts the combined effects of parent material, topography, climate, biological activity, and time.

“Surface Layer” means the soil that is ordinarily moved in normal tillage, or its equivalent in uncultivated soil, and is designated the **Plow Layer** or the Ap soil horizon.

“Subsurface Layer” means the soil horizon described by NRCS in the Soil Survey Report as the part of the soil profile below the surface layer.

“Subsoil” means the soil horizon described by NRCS in the Soil Survey Report as the part of the soil profile below the subsurface layer

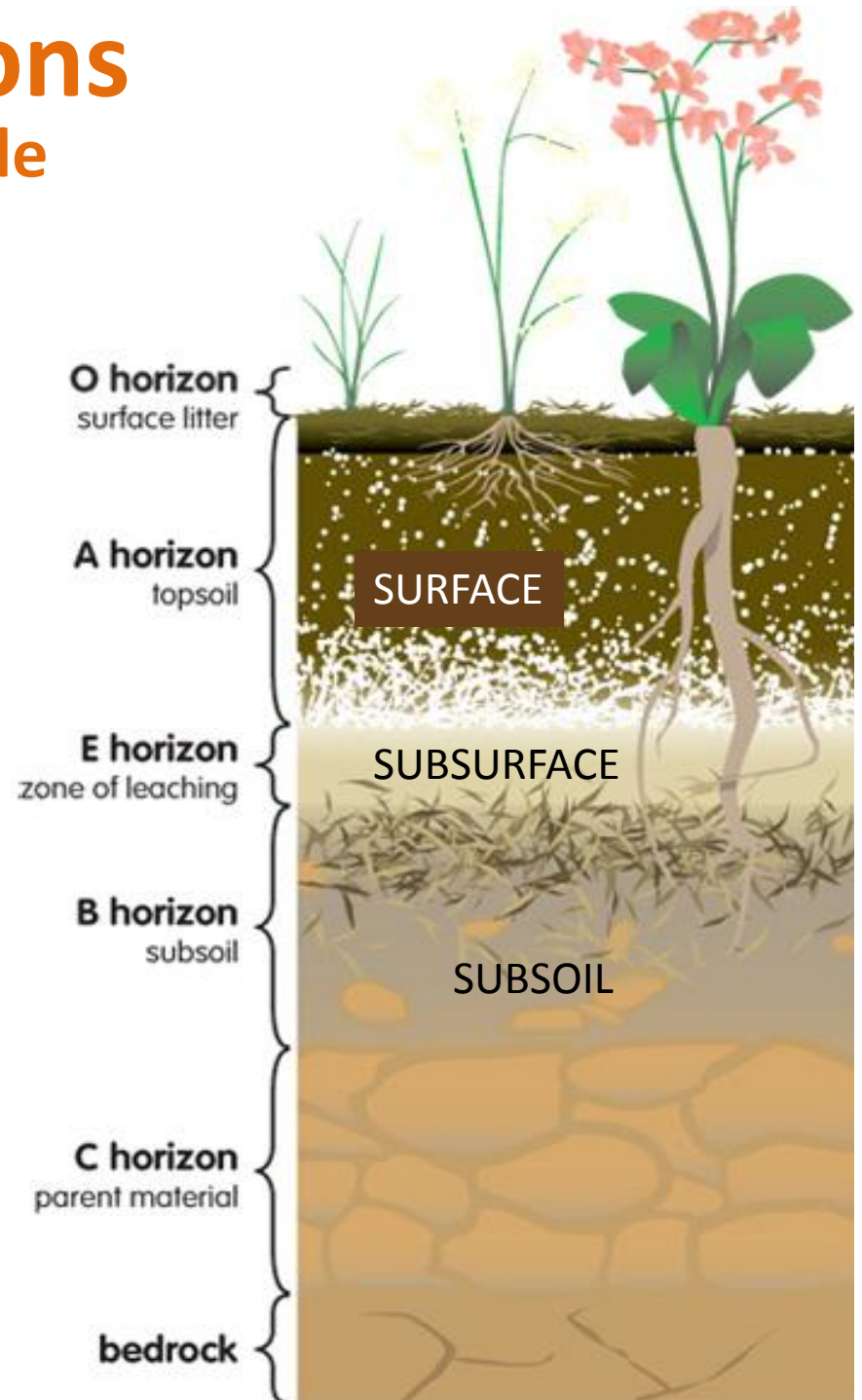
Definitions

Soil Profile

Plow Layer - the soil that is moved in normal tillage, otherwise known as the Ap soil horizon (average maximum thickness in New Jersey of 12 inches).

Common acceptance of plow layer nomenclature - same definition in the U.S., Canada, and the United Kingdom.

Commonality of soil disturbance standards - U.S. Forest Service considers compaction of forest soils greater than 12 inches major soil disturbance. USDA-NRCS, for cultural resources compliance, considers activities below the plow layer to constitute soil disturbance.



Definitions

Normal Tillage

- Generally accepted agricultural practices for seedbed preparation and cultivation of soil

Moldboard plowing
Disking
Chisel plowing
Etc.

Normal tillage is limited to the depth of the *surface layer, designated as the plow layer, which is the Ap Soil Horizon.*

“Tillage is generally accepted as a routine and acceptable agricultural practice.”

*-Rutgers Assessment of
Soil Disturbance on Farmland*



Photo courtesy of USDA NRCS.

Definitions

Bulk Density



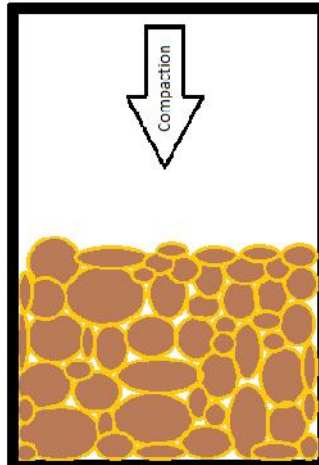
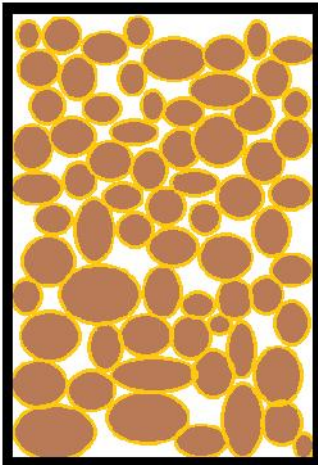
Brick = high bulk density,
low pore space



Sponge = low bulk density,
high pore space

<http://wmeearthcare.com/everyday-soil-science-4-bulk-density-porosity/>

An indicator of how well plant roots are able to extend into the soil, calculated as the dry weight of soil divided by its volume



Effect of soil compaction on root and seedling growth at three different soil bulk densities: Low, 0.7 g/cm³; Medium, 1.1 g/cm³; High, 1.6 g/cm³. (Stephanie Nelson, Honors Program project).

<http://www.ipm.iastate.edu/ipm/icm/node/5>

Definitions

Soil Compaction



Any activity other than normal tillage that results in:

- An increase in soil bulk density or consolidation OR
- Reduces a soil's capacity to infiltrate water

Examples:

- Preparing or using land for the placement of engineered structures such as
 - Footings
 - Foundations
 - Earth-retaining structures
 - Parking areas, or
 - Roadways
- Unless specifically identified by the Committee as an exempt agricultural practice.



<http://extension.missouri.edu/p/G1555>



Definitions

Soil Movement

- Modification of the soil profile including
 - Grading
 - Smoothing
 - Leveling
 - Cutting
 - Filling
 - Importation of soil
 - Exportation of soil
- Unless specifically identified by the Committee as an exempt agricultural practice.
- Soil movement does not include normal tillage



Definitions

Soil Disturbance =

- Soil Movement
- Soil Compaction
- The placement of:
 - Asphalt
 - Concrete
 - Gravel
 - Millings
 - Other similar materials

Unless specifically identified by the Committee as an exempt agricultural practice.



Not Considered Soil Disturbance

Unimproved Farm Lane –

Unsurfaced

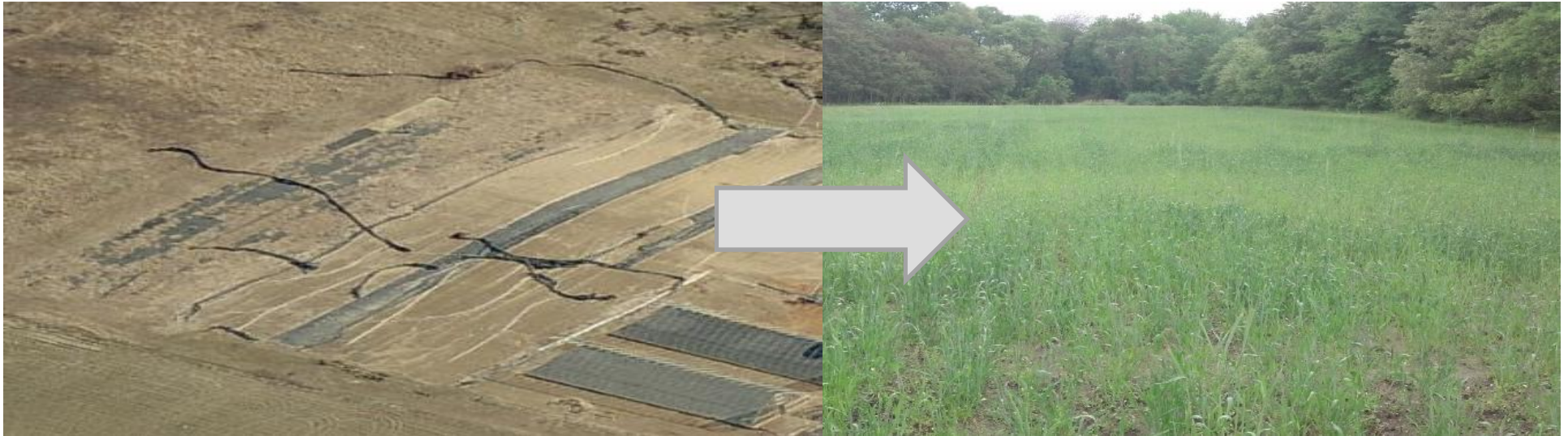
Used to access production fields

Not frequently or intensively used



Not Considered Soil Disturbance

Geotextile Fabrics - Permeable, woven and non-woven fabrics that allow for water infiltration into the underlying soil.



“It is the degree of attendant soil disturbance and not merely the use of geotextile that determines the effect of this kind of disturbance”

-Rutgers Assessment of Soil Disturbance on Farmland

Not Considered Soil Disturbance

Hoophouses



Not Considered Soil Disturbance

Solar Panels

